Wahl C150 Calibrator

C150 High Accuracy Portable Multifunction Calibrator

Superior Accuracy as compared to Competitors!

Simultaneous Measurement and Generation
Rugged IP54 Construction for On Site Use
Quick Connect Terminals
Measurement Data Recording
Laboratory Grade Accuracy

Automatic Calibration on HART Protocol Transmitter
21 CFR part 11 Compliant

C150 Portable Multifunction Calibrator

The Wahl C150 Portable Multifunction Calibrator integrates all the necessary functions for calibration and maintenance of processes, making it the ideal instrument for maintenance, quality control, and calibration.

Its ergonomic design and embedded software make the C150 an easy to use high performance calibrator.

IP54 rated and fully protected by an anti-shock boot, with integrated quick connect terminals and a high-contrast backlit display, it is comfortable to use in all conditions.

It's polycarbonate keypad protects it from dirt and grease, and the raised keys allow the C150 to be used with protective gloves. It has 10 user programmable configurations for use with repetitive jobs.

A Bluetooth® interface and quick access to functions makes this the perfect high performance instrument for on-site use.

C150 Features

The Wahl C150 is able to simultaneously measure and generate on 2 isolated channels. It has a wide high-contrast backlit display for use in low ambient light conditions.

The C150 is able to measure and generate voltage, current, frequency, resistance signals and also resistive probes and thermocouples.

Unit measures pressure when used with optional external pressure modules, and performs calibration automatically on HART protocol transmitters. It is able to drive some dry block and temperature baths for temperature sensor calibration.

C150 Calibrator is supplied with protective boot, 6 testing leads with crocodile clips, quick charging battery system, neck/shoulder strap, stand for desktop use, User Manual on CD Rom, and NIST Calibration Certificate.

Buy it, you'll like it; GUARANTEED! *

* USA Customers only

Optional DATACAL Software provides:
- Instrument Configuration
- Calibration
- Data Management
- Virtual Instrument

TRACEABLE TO NIST

ONE YEAR 1 WARRANTY

Calibration Services Available

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07/10
Rev A

C150 High Accuracy Portable Multifunction Calibrator

C150 Functions

QUICK CONNECT SYSTEM: This unique system is easy to use by pressing down on the top of the terminal, and inserting bare wires with a diameter up to 3 mm (or 10AWG), or compensated thermocouple connectors, and then releasing.

Wires are held tight between 2 brass plates which provide thermal stability to create excellent cold junction compensation for thermocouples.

This system also allows 4mm banana plugs or safety plugs to be connected on the front panel.

DISPLAY RESOLUTION: C150 has user selectable resolution to allow measurements to meet specific testing requirements.

FUNCTIONS: The C150 allows the following physical values to be measured and simulated:

- **Voltage**
- **Current**
- **Resistance**
- **Temperature by thermocouples, RTD and thermistors resistance**
- **Pressure measurement when used with optional external pressure module. (Simulation requires user supplied pressure pump)**
- **Frequency/counting from signal and dry contacts**

Allows scaling of process signals and corrections to temperature probes.

Compatible with HART transmitters by inserting a 250 ohms resistance, which allows uninterrupted digital data transfer.

Stores data and can send them to PC for analysis.

HART PROTOCOL: works with HART Protocol instruments:

- Connection of 1 to 15 analog sensors with 24V power supply
- Compatibility with Protocols «HART 5» and «HART 6». Setting and configuration of these sensors through the C150
- Loop supply with insertion of 250 ohm internal resistance
- "Verify" HART menu option: Verification of the current loops and the detectors (manually or automatically). All the information is stored in the Verification report.
- Loop current and detectors can be adjusted from the C150
- HART Instrument status: Information about the response of the instrument during test can be displayed: overload loop, out of limit variable.

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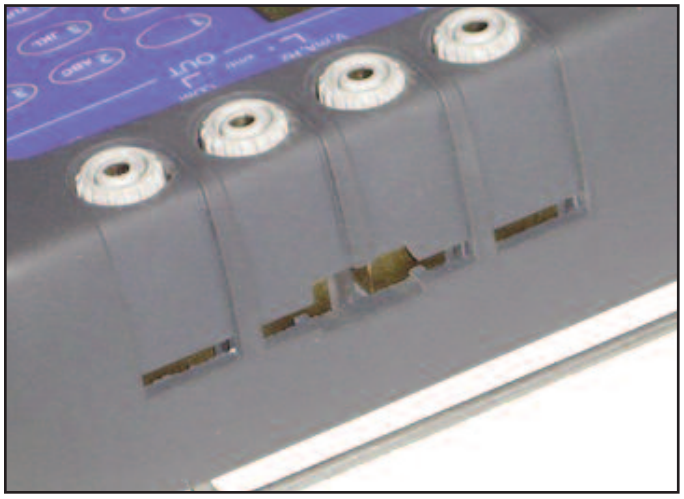


CALIBRATION: Sensor Calibration: Calibration coefficients can be implemented in order to correct sensors. C150 is able to generate calibration reports.

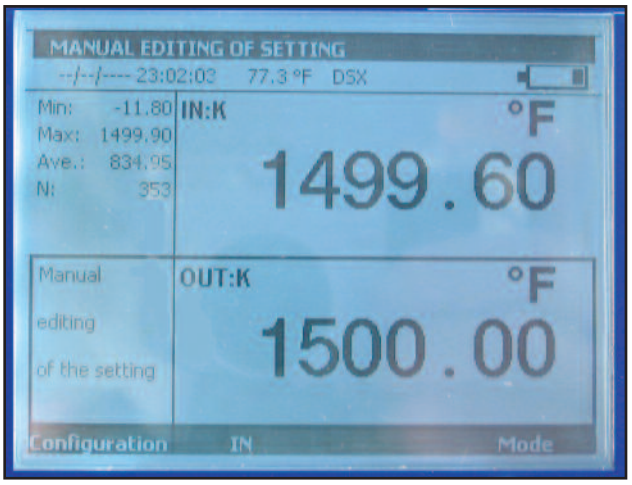
Electronic Devices Calibration: Calibration can be performed by comparison (2 probes and temperature source driven) or using signal generation. Two methods are available: manual or automatic, with uncertainty taken into account. Calibration setpoints are entered by user.

Transmitter Mode: The measured value is emitted as a 4-20mA or voltage signal to drive dry blocks and baths.

DISPLAY: C150's dual display simultaneously displays the measurement value, the emitted value, the gauge and the used functions. On the top line, date, time and external temperature are indicated. During measuring, Average, Maximum, Minimum, and the number of measurements are displayed on the left.

During emission, this part of screen displays all details of ramps, steps and constant value emission functions.

Drop-down menus are used with the navigator.



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C150 Calibration

Wahl C150 Calibrator

Functions and performances: @23°C +5°C

Accuracy is given in % of reading (C150 display) + fixed value

DC Current: Measurement

Range	Measuring Range	Resolution	Accuracy (1 year)	Remarks
0-20mA	0mA/24mA	0.1µA	0.007% + 0.8µA	Rin < 30Ω
4-20mA	3mA/24mA	0.1µA	0.007% + 0.8µA	Rin < 30Ω
100mA	0mA/100mA	0.1µA	0.009% + 2µA	Rin < 30Ω

C150 can measure up to 100mA with/without loop supply (24V).
Loop supply = 24 V ±100%
Temperature coefficient: < 10% of accuracy /°C. Display unit: °C, and °F
HART compatibility: input impedance Rin=280Ω
Display with linear or quadratic scaling

DC Current: Emission

Range	Resolution	Accuracy (1 year)
24mA	1µA	0.007% R + 0.8µA
4-20mA	1µA	0.007% R + 0.8µA
0-20mA	1µA	0.007% R + 0.8µA

Emission output with or without 24V loop supply

Pre-programmed steps

	0%	25%	50%	75%	100%
4-20mA linear	4	8	12	16	20
0-20mA linear	0	5	10	15	20
4-20mA quad	4	5	8	13	20
0-20mA quad	0	1.25	5	11, 25	20
4-20mA valves	3.8 - 4 - 4.2		12	19, 20, 21	

DC Voltage: Measurement

Range	Measuring Range	Resolution	Accuracy (1 year)	Remarks
+100mV	10mV + 100µV	1µV	0.005% + 2µV	Rin > 10MΩ
+1V	-100mV + 1V	10µV	0.005% + 8µV	Rin > 10MΩ
+10V	-1V + 10V	100µV	0.007% + 80µV	Rin = 1MΩ
+50V	-5V + 50V	1mV	0.007% + 0.5mV	Rin = 1MΩ

Rin = Input resistance

DC Voltage: Emission

Range	Meas Range	Resolution	Accuracy (1 year)	Min Load
+100mV	-5mV + 100mV	1µV	0.005% R + 2µV	1KΩ
+1V	-15mV + 1V	10µV	0.005% R + 8µV	2KΩ
+10V	-100mV + 10V	100µV	0.007% R + 80µV	4KΩ
+50V	-100mV + 50V	1mV	0.007% R + 0.5mV	4KΩ

Frequency and Counting: Measurement

Range	Resolution	Accuracy (1 year)
10kHz	< 0.01 Hz	0.01% Rdg
100kHz	0.1 Hz	0.01%

Threshold triggering: 1V
Unit scale: Pulse/min or Hz
Measurement on frequency signals and on dry contacts
Measurement for counting will be performed on defined time or infinite time.

Frequency and Pulses: Emission

Range	Resolution	Accuracy (1 year)
1000 Hz	< 0.01 Hz	0.01% R
100 kHz	1 Hz	0.01% R

Unit scale: Pulse/min or Hz
Pulse emission
Dry contacts simulation
Max amplitude: 20V (Selectable by user)

Resistance: Measurement

Range	Input Range	Resolution	Accuracy (1 year)	Remarks
400Ω	0 to 400Ω	1mΩ	0.006% R + 8mΩ	4 wires
3600Ω	0 to 3600Ω	10mΩ	0.006% R + 50mΩ	4 wires
50KΩ	0 to 50KΩ	100mΩ	0.008% R + 1Ω	4 wires

Resistance measurement with 2, 3 or 4 wires resistance measurement: automatic recognition of number of connected wires displayed on the screen.

Resistance: Emission

Range	Output Range	Resolution	Accuracy (1 year)	Remarks
400Ω	1 -4000Ω	10mΩ	0.006%R +8mΩ @1mA	I ext of 0.1 to 1mA
4000Ω	1-3600Ω	100mΩ	0.006%R +50mΩ @0.1mA	
50KΩ	1-50KΩ	1Ω	0.008%R +1Ω @1mA	I ext of 5µA to 50µA

Emission with pulsed available: refer to the manual for specifications
Temperature coefficient: < 5ppm /°C. 0°C to 18°C and 28°C to 50°C
Emission resistance: establishing time < 1ms: for compatibility with smart transmitters

Pressure: measurement with external digital sensor

Range	0-1 bar	0-3 bar	0-10 bar	0-30 bar	0-100 bar	0-300 bar	0-1000 bar
Absolute	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Relative	Yes	Yes	Yes	Yes	N/A	N/A	N/A

Resolution: 0.02% of Full Scale
Accuracy: 0.05% of Full Scale for 10°C and 40°C,
-0.1% of Full Scale -10°C to +10°C and 40°C to 80°C.

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Calibration Services Available

C150 Calibration

C150 RTD: Measure and Emission						
Sensor	Input Range	Resolution	Accuracy/1year Measure	Output range	Resolution	Accuracy/1year Emission
Pt 50 (α = 3851)	-220°C + 850°C	0.01°C	0.006% R + 0.04°C	-220°C + 850°C	0.01°C	0.006% R + 0.04°C
Pt 100 (α = 3851)	-220°C + 850°C	0.01°C	0.006% R + 0.03°C	-220°C + 850°C	0.01°C	0.006% R + 0.035°C
Pt 100 (α = 3916)	-200°C + 510°C	0.01°C	0.006% R + 0.03°C	-200°C + 510°C	0.01°C	0.006% R + 0.035°C
Pt 100 (α = 3926)	-210°C + 850°C	0.01°C	0.006% R + 0.03°C	-210°C + 850°C	0.01°C	0.006% R + 0.035°C
Pt 200 (α = 3851)	-220°C + 850°C	0.01°C	0.006% R + 0.04°C	-220°C + 850°C	0.01°C	0.006% R + 0.04°C
Pt 500 (α = 3851)	-220°C + 850°C	0.01°C	0.006% R + 0.03°C	-220°C + 850°C	0.01°C	0.006% R + 0.04°C
Pt 1000 (α = 3851)	-220°C + 850°C	0.01°C	0.006% R + 0.03°C	-220°C + 850°C	0.01°C	0.006% R + 0.035°C
Ni 100 (α = 618)	-60°C + 180°C	0.01°C	0.006% R + 0.05°C	-60°C + 180°C	0.01°C	0.006% R + 0.04°C
Ni 120 (α = 672)	-40°C + 205°C	0.01°C	0.006% R + 0.05°C	-40°C + 205°C	0.01°C	0.006% R + 0.04°C
Ni 1000 (α = 618)	-60°C + 180°C	0.01°C	0.006% R + 0.05°C	-60°C + 180°C	0.01°C	0.006% R + 0.04°C
Cu 10 (α = 427)	-50°C + 150°C	0.10°C	0.006% R + 0.18°C	-50°C + 150°C	0.10°C	0.006% R + 0.1°C
Cu 50 (α = 428)	-50°C + 150°C	0.01°C	0.006% R + 0.05°C	-50°C + 150°C	0.01°C	0.006% R + 0.05°C

Resistive probes measurements in 2, 3 or 4 wires: automatic recognition of number of connected wires displayed on screen
- Temperature coefficient: < 10% of accuracy / °C
- Accuracies are given for 4 wires connected probes
- Above specifications are for the C150 meter only, and do not include specific sensor or implementation conditions
- For RTD simulation accuracies are given for 1mA current
- Admissible Measurement current: 0.01mA to 1mA
- Establishing time: < 1ms for simulation (simulation on quick transmitters)

External Digital Pressure Modules for C75, C100 and C150 Calibrators

Absolute Pressure Modules *Includes cable for connection to Calibrator*

PMA0001	Absolute Pressure Module 14.5 psi (1 bar)
PMA0003	Absolute Pressure Module 43.5 psi (3 bar)
PMA0010	Absolute Pressure Module 145 psi (10 bar)
PMA0030	Absolute Pressure Module 435 psi (30 bar)
PMA0100	Absolute Pressure Module 1450 psi (100 bar)
PMA0300	Absolute Pressure Module 4350 psi (300 bar)
PMA1000	Absolute Pressure Module 14,500 psi (1000 bar)

Relative Pressure Modules *Includes cable for connection to Calibrator*

PMR0001	Relative Pressure Module 14.5 psi (1 bar)
PMR0003	Relative Pressure Module 43.5 psi (3 bar)
PMR0010	Relative Pressure Module 145 psi (10 bar)
PMR0030	Relative Pressure Module 435 psi (30 bar)

This digital pressure module is connected through a RS485 serial cable to the digital input connector. All data is digital.
Measurements are compensated in temperature due to a polynomial correction implemented into the EEPROM at factory.

ONE YEAR 1 WARRANTY

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C150 Calibration

C150 Thermocouples: Measure and Emission						
Type	**Input Range**	**Resolution**	**Accuracy/1year Measure**	**Output range**	**Resolution**	**Accuracy/1year Emission**
K	-250°C to -200°C -200°C to -120°C -120°C to +1372°C	0.2°C 0.05°C 0.05°C	0.50°C 0.15°C 0.0050% R + 0.08°C	-250°C to -50°C -50°C to + 120°C +120°C to + 1020°C +1020°C to + 1370°C	0.2°C 0.1°C 0.05°C 0.05°C	0.15% R 0.06°C 0.005% R + 0.05°C 0.007% R + 0.05°C
T	-250°C to -200°C -200°C to -100°C -100°C to +80°C +80°C to +400°C	0.2°C 0.05°C 0.05°C 0.05°C	0.50°C 0.05% R + 0.06°C 0.015% R + 0.07°C 0.06°C	-250°C to -100°C -100°C to + 0°C +0°C to + 400°C	0.2°C 0.05°C 0.05°C	0.1% R + 0.05°C 0.02% R + 0.06°C 0.055°C
J	-210°C to -120°C -120°C to +60°C +60°C to +1200°C	0.05°C 0.05°C 0.05°C	0.15°C 0.005% R + 0.07°C 0.0025% R + 0.06°C	-210°C to + 0°C +0°C to + 50°C +60°C to + 1200°C	0.05°C 0.05°C 0.05°C	0.03% R + 0.08°C 0.05% R + 0.07°C 0.005% R + 0.04°C
E	-250°C to -200°C -200°C to +100°C +100°C to +1000°C	0.1°C 0.05°C 0.05°C	0.30°C 0.06°C 0.005% R + 0.05°C	-250°C to +40°C +40°°C to +550°C +550°C to +1000°C	0.1°C 0.05°C 0.05°C	0.15°C 0.005% R + 0.12°C 0.005% R + 0.13°C
R	-50°C to +0°C +0°C to +150°C +150°C to +1768°C	0.5°C 0.2°C 0.1°C	+0.60°C +0.60°C +0.3°C	-50°C to + 0°C +0°C to + 350°C +350°C to + 1768°C	0.5°C 0.2°C 0.1°C	0.35% R + 0.4°C + 0.4°C + 0.25°C
S	-50°C to +150°C +150°C to +1450°C +1450°C to +1768°C	0.5°C 0.2°C 0.1°C	0.80°C 0.30°C 0.35°C	-50°C to + 0°C +0°C to + 350°C +350°C to + 1768°C	0.5°C 0.2°C 0.1°C	0.25% R + 0.4°C + 0.30°C + 0.25°C
B	+400°C to +900°C +900°C to +1820°C	0.2°C 0.1°C	0.005% R + 0.4°C 0.005% R + 0.2°C	+400°C to + 900°C +900°C to + 1820°C	0.2°C 0.1°C	0.005% R + 0.4°C 0.005% R + 0.2°C
U	-200°C to -100°C -100°C to + 660°C	0.05°C 0.05°C	+0.13°C +0.09°C	-200°C to + 400°C +400°C to + 600°C	0.05°C 0.05°C	+ 0.09°C + 0.11°C
N	-240°C to -190°C -190°C to -110°C -110°C to +0°C +0°C to -400°C +400°C to +1300°C	0.2°C 0.1°C 0.05°C 0.05°C 0.05°C	0.25% R 0.1% R 0.04% R + 0.06°C 0.08°C 0.005% R + 0.06°C	-240°C to -200°C -200°C to + 10°C +10°C to + 250°C + 250°C to + 1300°C	0.2°C 0.1°C 0.05°C 0.05°C	0.15% R + 0.10°C + 0.08°C 0.008% R + 0.05°C

Thermocouples: PlatineL, Mo, NiMo/NiCo, G, D, L, C:
For specifications, refer to the user manual which comes with the unit.
Accuracy is given for reference @ 0°C
With use of internal RJ (except couple B) add an additional uncertainty of 0.3°C
CJC localization can be selected by keypad programming, except for thermocouple type B:

- External at 0°C, internal (temperature compensation of instrument's terminals) or by temperature programming
- Temperature coefficient: < 10% of accuracy /°C. Display unit: °C, and F

Thermistors: Measure and Emission
Due to the 50K ohm range and the Steinhart-Hart equation, thermistors can be implemented in the C150.
The Steinhart-Hart equation is: $\frac{1}{T} = A + B\,(\ln(R)) = C\,(\ln(R))^3$ where A, B, C are usually calculated according to temperature at 0°C, 25°C, and 70°C.

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ONE YEAR 1 WARRANTY

Calibration Services Available

C150 Calibration

C150 Additional Functions

FILE MENU: User can save up to 10 full configurations of the instruments and recall them as desired.
Configurations can be saved and recalled in function of user and of use. Configurations include all programming done on instrument, as the range.

CONTRAST ADJUSTMENT: Screen's contrast can be adjusted as desired to fit with measurement environment.

SCREEN BACKLIGHTING: Time of backlighting can be programmed to save battery.

BATTERY LIFE: C150 Battery Life is 5-10 hours depending on functions used.

SCALING: In measurement and simulation, scaling allows process signals to be displayed in % of FS or in all other units. This function also allows sensors to be corrected after a calibration.

RELATIVE MEASUREMENT:
- Programming of a reference value different from the one of the instrument (NUL function).
- Subtracting of constant value by measuring or by programming it from a measured value (TARE function).

SQUARE ROOT: In current measurement and simulation, this function takes into account a quadratic signal coming from a △P transmitter.

STATISTICAL FUNCTIONS: Average, Minimum, Maximum, and number of measurements done are always displayed. Reset key allows values to be updated.

TRANSMITTER TESTS: Transmitters can be verified using user procedures.
20 procedures can be stored as well as test results.
Deviation curves are displayed.
Test Reports editing.

SIMULATION MENU: Simulation value is set by entering value on keypad or using the cursor to change the appropriate digit.

RAMPS GENERATION: Starting, ending and length time values of simple or cyclic ramps can be simulated. Number of ramps can also be adjusted in case of cyclic ramps for any signals.

STEPS SIMULATION: 2 modes are provided.
- Program mode: Starting value, number of steps and the duration of step.
- Manual mode: User has approximately one hundred preset values.

In current simulation, user will have some additional preset values in function of range and according to 0%, 25%, 50%, 75% and 100% from selected gauge.
Choice is done between gauges:
- 0-20mA: linear or quadratic
- 4-20mA: linear or quadratic

SYNTHESIZER: With 100 programmable values, the C150 allows complex curves to be generated.

TRANSMITTER FUNCTION: C150 is able to be used as a transmitter. Measurement input is copied on the output with scaling.

SWITCH TEST: For Temperature or Pressure, the C150 can control the trigger levels for electronic thermostats and pressure switch.

MEMORY: C150 can record data automatically or on user request. 10,000 data can be stored and displayed on the screen as curve or list.

C Series Calibrators Specifications	
Memory	10 User Specified Configurations
Language	5 user Selected Languages: English, French, Spanish, German and Italian
Display	Backlight LCD with Adjustable Contrast
Recommended Ambient Conditions	0° to 50°C, 10 to 80% Relative Humidity
Maximum Ambient Conditions	-10° to 55°C, 10 to 80% Relative Humidity
Battery Life Power Supply	5 - 10 hours depending on Functions Selected, Rechargeable NiMH Batteries
Weight Dimensions	1.9 lbs (900g) 8.3 x 4.3 x 2.0 in. (210 x 110 x 50mm)

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Included: C150 Calibrator is supplied with protective boot, 6 testing leads with crocodile clips, quick charging battery system, neck/shoulder strap, stand for desktop use, User Manual on CD Rom, and NIST Calibration Certificate.

Specifications are subject to change without notice.

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